



Reconstruction of Teachers' Strategies in Cultivating Honest Character through Physics Learning: A Systematic Synthesis Based on Values, Affective, and Cognitive

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ABSTRACT

Purpose of the study: Study aims to systematically synthesize teachers' strategies in developing students' honest character through physics learning and to identify effective strategy patterns, research gaps, and directions for developing character-based learning in the modern learning era.

Methodology: This study used a Systematic Literature Review (SLR) approach with the PRISMA protocol. A total of 29 reputable journal articles published between 2020 and 2025 were analyzed, sourced from Google Scholar, ERIC, Scopus, and DOAJ. Data were analyzed using thematic synthesis to group findings based on pedagogical strategies, teacher roles, assessment design, and affective and moral dimensions in physics learning.

Main Findings: The study results show that honest character can be effectively developed through project-based learning, authentic assessment, experimental reflection, formative feedback, and the integration of moral values into the scientific process. Teachers act as value facilitators, connecting cognitive, affective, and moral dimensions. Furthermore, digital literacy and ethical technology policies are important supporting factors in maintaining academic integrity.

Novelty/Originality of this study: The novelty of this research lies in the formulation of an integrative conceptual framework that positions honesty as a core value in scientific process-based physics learning. Limitations of this research include its reliance on secondary sources and the paucity of long-term empirical research specifically examining the impact of honesty-based physics strategies.

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1. INTRODUCTION

Education, from ancient times to the present, has served not only as a vehicle for transferring knowledge but also as a means of shaping students' character. Throughout its history, teachers' strategies for character formation have undergone significant transformation. In the early days of traditional education, teachers were viewed as primary moral role models, teaching values such as honesty, discipline, and responsibility through role models and direct advice [1]. With the development of the times and the emergence

of the modern educational paradigm, teachers' strategies have shifted toward values-based and experiential learning [2]. This approach emphasizes active student engagement through moral reflection, case studies, and collaborative practices that foster ethical awareness. In the past two decades, in line with the emergence of 21st-century education, teachers have been required to integrate the character of honesty into learning designs that are more authentic, contextual, and adaptive to technologies such as artificial intelligence (AI) and digital literacy.

These changes in learning strategies also reflect the global dynamics of physics and science education worldwide. Physics learning is no longer seen simply as a means of understanding concepts and formulas, but rather as a space for developing scientific values and academic character. In various countries, science education reforms emphasize the importance of integrity, rigor, and honesty throughout the scientific process. Recent research confirms that project-based approaches, formative assessment, and reflective exploration of experimental results can help students understand that scientific truth is impossible to achieve without intellectual honesty. In a global context, modern physics curricula are also beginning to incorporate affective and moral components as part of character-oriented learning, as these values have been shown to play a crucial role in building an ethical scientific culture [3].

The affective aspect of physics learning for students has been a major focus in many contemporary studies. Research shows that well-facilitated emotional experiences such as awe, interest, and even confusion can foster scientific attitudes, curiosity, and perseverance. These affective experiences play a significant role in developing honest character, as they encourage students to value the authentic process of seeking truth without manipulation of results. Physics teachers who are able to integrate affective, cognitive, and moral aspects in their learning strategies have been shown to be more successful in fostering academic integrity and ethical awareness in students. The importance of honest character in education cannot be separated from 21st-century demands that emphasize integrity, fairness, and academic responsibility. Honesty is not merely a traditional moral value, but also the foundation of academic and professional credibility. Students with honest character demonstrate an open attitude to mistakes, objectivity in thinking, and consistency in reporting learning outcomes. Conversely, dishonest behavior such as academic cheating, plagiarism, or manipulation of scientific data reflects a lack of personal integrity and threatens the quality of learning [4]. Factors such as academic pressure, lack of supervision, and minimal ethics education have been shown to exacerbate this phenomenon. Therefore, learning strategies that emphasize moral reflection, authentic assignments, and values-based feedback are considered most effective in fostering academic honesty.

When honesty is not instilled in students, the impact is felt in both the short and long term. In the short term, students tend to rely on instant methods to achieve learning outcomes, lose their sense of responsibility, and struggle to develop critical thinking skills. In the long term, a weak honesty can reduce the quality of human resources, weaken academic culture, and ultimately hinder national development. Conversely, education that instills honesty from an early age can produce a generation with integrity, tenacity, and the ability to face global challenges ethically and professionally [5].

In the context of physics learning, honesty plays a fundamental role because physics itself is rooted in objectivity and the search for truth through empirical evidence. The value of honesty is reflected in students' willingness to report experimental results truthfully, acknowledge measurement errors, and uphold the validity of scientific data [6]. Recent studies have shown that physics can be a strategic vehicle for character education if it is designed contextually, reflectively, and incorporates local wisdom. Through project-based learning, scientific collaboration, and authentic assessment, physics teachers not only transfer knowledge but also foster ethical awareness, academic responsibility, and honesty in thought and action. Various studies have shown that character education, particularly honesty, is a fundamental element in building academic integrity [7]. However, most studies still position honesty as a general value separate from the learning design of specific disciplines. In the context of physics learning, studies specifically mapping teacher strategies for integrating honesty into the scientific process remain partial and fragmented. This research gap indicates the absence of a systematic synthesis that comprehensively links physics pedagogical strategies to the strengthening of honest character [8].

The urgency of this research is further heightened by the increasing challenges to academic integrity in the digital age, such as plagiarism and the misuse of AI based technology [9]. Physics, as a science that emphasizes objectivity, data integrity, and experimental validity, holds strategic potential as a vehicle for building honest character. Therefore, a systematic study is needed that not only maps the strategies used but also provides insight into problem-solving through a values-oriented learning approach [10]. Based on the results of 29 analyzed literature reviews, it appears that the formation of honest character through physics learning requires a holistic approach that combines pedagogical strategies, environmental support, and institutional policies. A good learning system not only encourages students to understand physics concepts but also internalizes the values of honesty as an integral part of the scientific process. Therefore, this study uses a Systematic Literature Review (SLR) approach to thoroughly analyze various empirical and conceptual findings regarding strategies for forming honest character in physics learning across various educational contexts. Through this systematic synthesis, it is hoped that a comprehensive picture of how honesty values can be integrated, developed, and evaluated sustainably in modern physics learning is obtained.

This study aims to: (1) identify and analyze teacher strategies in building honest character through physics learning (2) synthesize research findings related to the role of pedagogy, assessment, and affective dimensions in strengthening honesty and (3) formulate implications and recommendations for developing honest character-based physics learning.

2. RESEARCH METHOD

This study used the Systematic Literature Review (SLR) method with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) approach. This method was chosen because it is able to provide a comprehensive understanding of the results of previous research in a systematic, transparent, and replicable manner. The SLR approach allows researchers to identify, assess, and synthesize relevant literature to obtain evidence-based conclusions regarding the formation of honest character in physics learning. Meanwhile, the PRISMA approach is used to ensure that each stage in the literature review process is carried out in a structured manner, starting from source identification, article selection, feasibility assessment, to determining the final articles included in the analysis.

The research sample consisted of 29 scientific journal articles selected using purposive sampling techniques based on the following criteria: (1) published in 2020–2025 (2) discussing character education or honesty and (3) relevant to the context of physics or science learning. The data collection instrument consisted of an article extraction sheet containing the article's identity, research objectives, methods, learning strategies, and findings related to honesty.

Data Collection Instrument Outline: Character focus (honesty/integrity); Physics learning strategies; Assessment types; Teacher roles' Supporting and inhibiting factor. The first stage is identification, where researchers search for articles using academic databases such as Google Scholar, ERIC, Scopus, and DOAJ. Keywords used include "character education", "honesty", "academic integrity", "physics learning", and "science education." Articles found are then collected based on the year of publication, relevance to the theme, and suitability to the context of physics learning. The second stage is screening, where articles that are irrelevant, duplicate, or do not meet the inclusion criteria are excluded. The inclusion criteria in this study include: 1) Articles published in accredited scientific journals; 2) Includes a focus on character education, especially honesty; 3) Has a direct relationship to the context of learning physics or science.

After that, an eligibility assessment was carried out to examine the abstract and content of the article in more depth to ensure suitability with the research objectives

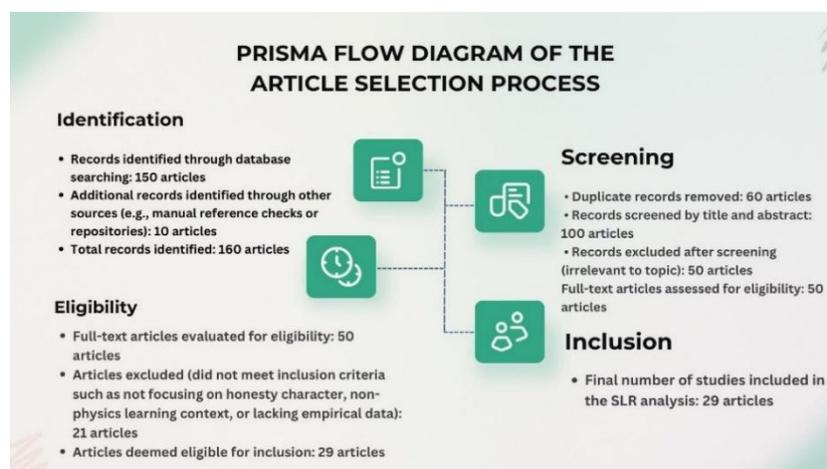


Figure 1. PRISMA Flow Diagram Of The Article Selection Process

The final stage is inclusion, where articles that meet all criteria are included in the analysis stage. This process is illustrated in the PRISMA flowchart, which consists of four main stages: 1) Identification of the total number of articles found from the database; 2) Screening the number of articles that are filtered and eliminated due to irrelevance or duplicates; 3) eligibility number of articles fully reviewed to assess eligibility; 4) inclusion of the final number of articles used in the systematic analysis. Data analysis was conducted using *thematic synthesis* to group research findings based on key themes, such as values-based learning strategies, the role of physics teachers in fostering honesty, and factors that hinder and support honest character development. Through the PRISMA approach, research results are expected to be more focused, credible, and provide a tangible contribution to the development of character education in physics learning.

3. RESULTS AND DISCUSSION

Based on the article selection process using the PRISMA approach, 29 articles met the inclusion criteria for analysis in this study. Each article was selected based on its relevance to the theme of honest character formation in the context of physics and science learning. The articles covered various perspectives ranging from pedagogical strategies, the role of teachers, the influence of the social environment, to the implications of technology on academic integrity. Thematic analysis was conducted to identify common patterns, research gaps, and innovative learning strategies that are effective in fostering honest character. A summary of the results of each article that served as the basis for the synthesis is presented in the following table as a comprehensive overview of the main findings from the reviewed literature.

The analysis showed that project-based learning strategies, reflective experiments, and authentic assessments were consistently associated with increased academic honesty. Teachers who implemented formative feedback and emphasized the scientific process demonstrated more positive outcomes than those who employed solely outcome-based evaluative approaches. These findings directly address the research objective of the study, which examined the effectiveness of teacher strategies in fostering honest character through physics instruction.

Table 1. Research results on honest character in physics learning using the SLR approach

Researchers and Year of Research	Journal	Research result
[11]	Journal of Business and Finance Librarianship	This review shows that data literacy programs in higher education and secondary schools emphasize practical competencies (basic data analysis, visualization) and disciplinary contextual relevance. Key barriers include a lack of consistent curriculum standards, differences in faculty competencies, and the need for technical resources. Effective interventions typically combine project-based assignments and cross-disciplinary collaboration.
[12]	Journal of School Leadership and Management	The review shows that education system change is influenced by policy factors, leadership, resource capacity, and school culture. Effective support includes leadership commitment, ongoing training, and structural incentives; common barriers are bureaucracy, stakeholder resistance, and limited financial resources. Recommendation: a contextual and incremental approach to change with ongoing evaluation mechanisms.
[13]	Journal of Educational Physics in Practice	The review revealed variations in teachers' views on the nature of intelligence (fixed vs. growth mindset), which influence their teaching practices and student feedback. Teachers with a <i>growth mindset orientation</i> are more likely to implement instructional strategies that promote effort, process feedback, and learning resilience; however, changing teacher beliefs requires systematic professional intervention. Recommendations include training focused on evidence-based feedback and reflection on practice.
[14]	Journal of Cogent Education	This study found that honesty is understood as an intelligent character trait reflected in students' daily behavior; family factors, the school environment, and educator practices play a significant role in shaping honesty. Consistent moral education interventions (parental involvement and reinforcement of school norms) increase the frequency of honest behavior in students.
[15]	Journal of Higher Education	This article shows that student engagement in

Researchers and Year of Research	Journal	Research result
	Research and Development	cheating behavior is influenced by a combination of individual (e.g., prosocial orientation, risk perception), contextual (task load, supervision), and systemic (institutional policies) factors. Protective factors include an understanding of the value of honesty, valid assessment design, and an academic culture that supports integrity. The authors propose a multilevel framework for addressing academic cheating that combines prevention, education, and enforcement. Results indicate that a combination of preventive measures (integrity education), assessment designs that minimize opportunities for cheating, and fair enforcement mechanisms is more effective than a punitive approach alone.
[16]	Journal of Assessment and Evaluation in Higher Education	This study examines how AI-based tools (e.g., ChatGPT) alter the opportunities and mechanisms for cheating. Results suggest that emphasizing authentic task design, digital literacy education, and AI use policies can help maintain academic honesty. Furthermore, communicating the value of honesty and transparency of rules to students is crucial for reducing cheating.
[17]	Journal Innovations in Education and Teaching International	This study emphasizes the importance of character education (including honesty) at the university level through formal curricula, character development activities, and campus culture. Effective character programs integrate values teaching, practical experiences, and reflective assessment so that students internalize honesty, not just obeying rules.
[18]	Journal Church Communication and Culture	This study maps how values (including character values such as honesty, fairness, and perseverance) emerge in the science education literature. It finds that students' values relate to motivation, engagement, and goal orientation, and that empirical research on how science learning (including physics) systematically shapes character is limited. The authors recommend explicit integration of values into curriculum design and long-term research.
[19]	Journal of Studies in Science Education	This article introduces a practical method for integrating character education into everyday science instruction—involving reflective activities, local context, and values-based formative assessment. Results indicate increased awareness of values and character behaviors among participants when implementation is consistent with learning objectives and supported by teacher training.
[20]	Journal of Science Education Communication and Public Engagement	The study examined the affective and existential aspects of student engagement in physics; it found a relationship between emotional experiences (awe, facilitated confusion) and the development of scientific attitudes/character traits such as persistence and curiosity. The implication is that physics teachers can design learning experiences that trigger affective resonance to support positive
[21]	Cogent Education Journal	

Researchers and Year of Research	Journal	Research result
[22]	Cogent Education Journal	<p>scientific attitudes and character traits. Case studies from the Indonesian context demonstrate that strategies for transforming local wisdom values into learning activities (including simple science/physics) effectively enhance character traits such as honesty, discipline, and respect in students. Implementation involving the community and local context yields more meaningful and sustainable results.</p>
[23]	Journal Cogent Social Sciences	<p>The study found that research on the metaverse in education is still relatively new and focuses on pedagogical potential (engagement, immersive learning) and challenges (infrastructure, access, curriculum design, ethics/privacy). Studies show preliminary evidence that immersive experiences can improve motivation and some aspects of learning, but evidence of consistent improvements in learning outcomes is limited and requires longer-term empirical research.</p>
[24]	Journal of Production and Manufacturing Research	<p>Key researchers in playful learning highlight its benefits on social-emotional engagement, creativity, and understanding of basic concepts. However, there is significant variation in definitions and methodologies; quantitative evaluations of academic impact often show modest effects and depend on intervention design and teacher training. The authors recommend standardization of terminology and longitudinal study designs.</p>
[25]	Cogent Education Journal	<p>Citizen science in schools increases students' interest in science, practical skills, and scientific literacy; the most successful programs are integrated with the curriculum and involve external collaborations (e.g., universities, environmental organizations). Barriers include teacher preparedness, resources, and the need for appropriate assessments. Recommendations: support teacher training and project design relevant to the local context.</p>
[26]	Journal Education Review	<p>Studies have found that place-based education strengthens the connection between local context and learning, increases student engagement, and promotes interdisciplinary learning. Successful implementation relies on community collaboration, local curriculum adaptation, and teacher support. Challenges include scalability, consistent outcome assessment, and integration with national standards.</p>
[27]	Journal Education	<p>The review indicates that key themes in CIE teaching include global-local perspectives, comparative methodologies, and interdisciplinary curriculum development. Effective teaching methods include case studies, field projects, and critical discussions; barriers include limited resources, access to international data, and the need for faculty training. The authors highlight the need for more contextual and reflective teaching materials.</p>

Researchers and Year of Research	Journal	Research result
[28]	Journal of Distance Education	<p>The study identifies trends toward the integration of smart technologies, project-based learning, and an orientation toward 21st-century competencies. The “Engineering Education 5.0” model emphasizes industry collaboration, soft skills, and lifelong learning. The article concludes that curriculum transformation is necessary, but challenges include infrastructure readiness and teacher training.</p>
[29]	Cogent Education Journal	<p>The review found that vocational reforms focused heavily on linking educational institutions with industry, improving technical and soft skills, and utilizing blended learning models. Challenges include variations in quality across institutions, funding, and regional policies. The best interventions involve long-term industry partnerships and competency-based curricula.</p>
[30]	Cogent Education Journal	<p>This qualitative study found a contradiction between the ideal value of honesty and institutional pressures (publications, rankings). Academics and students demonstrated a high level of awareness of the importance of integrity, but daily practices were often influenced by the competitive context. Recommendations: strengthening institutional values and contextualizing ethics training.</p>
[31]	Journal of Assessment and Evaluation in Higher Education	<p>Educational interventions designed to encourage students to reflect on moral wrongdoing (e.g., case studies, structured discussions) increase moral sensitivity and the likelihood of choosing honest actions in subsequent academic situations. The effects are strongest when the intervention is followed by follow-up and contextual learning. This article examines the role of personality traits (honesty–humility) and descriptive norms (what is considered common practice) on the likelihood of cheating. They found that the honesty–humility trait predicted a decrease in cheating behavior, but descriptive norms that reflect the prevalence of cheating behavior in the environment could weaken the trait's effect. Implication: Strengthening positive norm role models in educational settings.</p>
[32]	Journal of Moral Education	<p>The concept of “brutalist honesty” is proposed as an open and direct approach to fostering professional honesty—e.g., honest feedback, exposure to ethical consequences. The authors report that this approach can increase ethical awareness and honest behavior when implemented alongside mentor support and a safe culture for learning.</p>
[33]	Journal of Studies in Higher Education	<p>This study emphasizes that valid assessment instruments (measuring true competencies) reduce incentives for cheating. Recommendations include the use of authentic tasks, process-focused formative assessments, and multi-layered assessment mechanisms to curb dishonest behavior. This assessment design approach is</p>
[34]	Journal Advances in Medical Education and Practice	

Researchers and Year of Research	Journal	Research result
[35]	International Journal of Science Education	<p>considered more proactive than simply relying on punishment.</p> <p>Studies have found that instructional clarity (goals, steps, examples) is positively correlated with students' learning motivation and self-confidence. This increased motivation and confidence has the potential to foster more proactive learning characteristics (e.g., persistence, responsibility for learning). Recommendation: Teachers need to emphasize goal clarity and continuous feedback to foster positive attitudes and character.</p> <p>Research shows that parents' attitudes toward physics are related to children's attitudes toward the subject; parental support and expectations influence children's interest and persistence—dimensions associated with the development of academic character (e.g., responsibility, work ethic). Implications: Physics learning programs that aim to build character need to involve communication and collaboration with parents. The article outlines essential experimental practices (planning, conducting, reflecting) and shows that allowing space for reflection and learning about the experimental process enhances scientific attitudes and character traits such as rigor, scientific honesty (truthfulness in reporting data), and responsibility. Practical recommendations for teachers: structure experiments to emphasize ethical and reflective practices.</p>
[36]	International Journal of Science Education	<p>Focusing on early childhood, this study highlights how trustful play impacts early interest and attitudes toward physics concepts; aspects of trust and social interaction are related to the development of social characteristics such as cooperation, honesty, and a sense of responsibility for group tasks.</p> <p>This review emphasizes that curriculum design and pedagogical approaches influence both student participation and the development of attitudes and character; a contextualized and relevant curriculum tends to enhance motivation, academic solidarity, and scientific ethics among students. The authors recommend the explicit integration of values/character aspects into the physics curriculum.</p>
[37]	International Journal of Science Education	<p>Analysis of physics Olympiad participants shows that individual support (mentoring, gradual challenges) fosters performative character traits such as perseverance, hard work, and self-regulation. The findings imply that formal physics instruction can also employ differentiation and mentoring strategies to foster similar character traits in regular students.</p>
[38]	European Early Childhood Education Research Journal	
[39]	International Journal of Science Education	
[40]	Journal of Studies in Science Education	

The results of this study indicate that honesty does not develop instantly, but rather through learning experiences that emphasize scientific process, reflection, and responsibility [41]. This finding aligns with

previous research emphasizing the importance of authentic assessment and values-based learning. In general, the study's findings can be generalized to the fact that reflectively designed physics learning has great potential to shape honest character [42]. Implications of this research include strengthening the role of teachers as value facilitators, developing a character-based physics curriculum, and developing integrity oriented assessment policies [43]. Limitations of this research lie in the nature of the literature review and the lack of longitudinal empirical studies. Therefore, further research based on experiments and field studies is recommended [44].

A systematic review shows that character education, particularly the strengthening of honesty, holds a strategic position in the modern education system. Based on the reviewed literature, teachers' strategies for instilling honesty have undergone a long evolution. In the early stages, teachers served as moral role models, teaching honesty through role models and habituation. However, in the past two decades, this approach has evolved toward values-based learning and moral reflection, emphasizing active student involvement. Several studies confirm that moral education involving the family, the school environment, and the reinforcement of social norms has been shown to significantly increase students' honest behavior. Therefore, the formation of honest character should be viewed as an ongoing collaborative process between educators, parents, and the social environment, rather than simply a theoretical teaching [45].

The transformation of character education is also closely related to the shifting paradigm of physics learning globally [46]. Physics, which was once focused on cognitive aspects and conceptual mastery, is now understood as a platform for developing scientific values such as integrity, rigor, and academic responsibility. International studies show that integrating honesty into physics learning can be achieved through authentic task design, formative assessment, and experimental activities that encourage data transparency. Assessment designs that emphasize processes and evidence-based feedback have been shown to be more effective in encouraging honest behavior than punishment-based approaches. Therefore, evaluation systems and academic policies should function not only as tools for measuring learning outcomes but also as instruments for fostering student integrity.

Beyond pedagogical aspects, technological developments are also a crucial factor in discussions about academic honesty. Several studies highlight the role of artificial intelligence (AI), such as ChatGPT, in shaping new dynamics of learning behavior. While this technology can open up opportunities for cheating, research shows that with the implementation of ethical policies, digital literacy, and regulatory transparency, AI can actually serve as a means to strengthen academic honesty. This indicates that honesty is no longer solely an individual's moral responsibility, but rather the result of an education system that is able to adapt to technological advances and changes in student learning behavior [47].

From an affective perspective, numerous studies have shown that emotional experiences in physics learning contribute significantly to the development of students' character. The feelings of awe, curiosity, and even confusion that emerge during experiments have been shown to foster perseverance, intellectual honesty, and a sense of responsibility. Physics teachers who are able to manage students' emotional experiences reflectively can create a learning environment that fosters positive character values. Furthermore, findings from the Indonesian context show that physics learning that integrates local wisdom values successfully fosters honesty, discipline, and respect in a more meaningful and sustainable way. This demonstrates that character education must be contextual, relevant to students' cultures, and developed holistically through hands-on learning activities [48].

The importance of honesty in physics education can also be seen from its implications for students' learning outcomes and academic behavior. Students who demonstrate academic honesty tend to be more open to mistakes, think objectively, and are able to account for the results of their experiments [49]. Conversely, students who lack a foundation of honesty are more susceptible to cheating, lose their sense of responsibility, and tend to prioritize results over process. In the short term, this reduces the quality of learning and trust among class members. In the long term, weak student integrity can impact the quality of human resources and the credibility of educational institutions. Therefore, character education that instills honesty from an early age is a crucial investment in building a resilient generation with integrity and prepared to ethically face the complexities of the modern world.

Overall, the results of this Systematic Literature Review demonstrate that the formation of honest character in physics learning requires a holistic approach that combines moral, affective, and cognitive dimensions. Its successful development depends on the role of teachers as value facilitators, adaptive curriculum design, and an evaluation system that supports the practice of scientific honesty [50]. Although limitations remain in the systematic implementation of honesty values, the results of this study provide a theoretical and practical basis for the development of character-based physics learning strategies. By prioritizing honesty as an integral part of the scientific process, physics education can play a significant role in producing a generation of learners who not only excel academically but also possess high integrity and moral responsibility.

4. CONCLUSION

This study concludes that teacher strategies in physics learning that emphasize the scientific process, reflection, and authentic assessment are effective in developing honest character in students. This synthesis produces a conceptual framework that places honesty as a core value of physics learning and can serve as a basis for developing a character-based physics learning theory. Furthermore, modern challenges such as technological developments and the use of AI need to be addressed through digital literacy and ethical policies that support academic integrity. Overall, physics education designed with an emphasis on honesty not only improves the understanding of scientific concepts but also shapes the personality of students who are resilient, responsible, and ready to compete with dignity in the global era.

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AUTHOR CONTRIBUTIONS

Raden Muhammad Afrialdi was responsible for the "Conceptualization, methodology, investigation, formal analysis, and writing of the original draft". Astalini contributed to the "Conceptualization, methodology, supervision, and review and editing of the manuscript". Dwi Agus Kurniawan contributed to the "Methodology, validation, supervision, and review and editing of the manuscript".

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

USE OF ARTIFICIAL INTELLIGENCE (AI)-ASSISTED TECHNOLOGY

The authors declare that no artificial intelligence (AI) tools were used in the generation, analysis, or writing of this manuscript. All aspects of the research, including data collection, interpretation, and manuscript preparation, were carried out entirely by the authors without the assistance of AI-based technologies.

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